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Lattice QCD calculations for Nuclear Physics

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Lattice QCD has matured into a powerful nonperturbative tool for directly probing the low-energy regime of the strong interaction from the QCD Lagrangian. Specifically, lattice QCD now offers quantitative insights into two- and three-nucleon interactions, nuclear binding energies, hypernuclear forces, and electroweak matrix elements relevant to neutrino-nucleus scattering and double beta decay. Despite the challenges of signal-to-noise degradation and computational scaling for multi-baryon systems, recent algorithmic developments and analysis techniques have enabled ab initio calculations of hadronic and nuclear observables with increasing precision. Moreover, lattice QCD plays a pivotal role in constraining effective field theories and informing phenomenological models, bridging the gap between fundamental theory and experimental observables.

In this talk, I will present key results obtained by the NPLQCD collaboration. I will focus on baryon-baryon interactions and discuss how these findings compare with results from other lattice collaborations.

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